

Surface Water Drainage Engineering Report

Woodborough House – Annex Development

Planning Reference: PL/2025/09902

Prepared by: Going Group Ltd T/A Going Underground

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1. Introduction

This report provides a full engineering justification of the revised surface water drainage strategy for the proposed annex at Woodborough House. The design has been revised to a shallower soakaway profile to improve demonstrated groundwater separation while maintaining adequate hydraulic performance.

2. Design Criteria

Parameter	Adopted Value
Rainfall return period	1 in 100 year
Climate change allowance	+40%
Rainfall source	FEH22 (Annual Max)
Infiltration standard	BRE Digest 365
Factor of Safety	2.00
Infiltration test date	Early December 2025
Half drain time criterion	< 24 hours

3. Site and Catchment

The total impermeable area draining to the soakaway is 156.00 m², as adopted from the original drainage calculations.

4. Revised Soakaway Design Summary

Item	Value
Length, L	4.00 m
Width, W	2.50 m
Effective depth, D	1.00 m
Void ratio, n	0.90
Storage volume	9.00 m ³
Conservative infiltration area	6.50 m ²

5. Results Summary

Duration (min)	Inflow (m ³)	Outflow (m ³)	Required Storage (m ³)
15	5.54	0.39	5.14

30	7.42	0.79	6.64
60	9.54	1.58	7.97
120 (Critical)	11.23	3.15	8.08
240	12.71	6.30	6.41

The critical duration is 120 minutes with a required storage volume of 8.08 m³. The revised soakaway provides 9.00 m³ of storage. The calculated half drain time is 2.86 hours.

Prepared and approved by:

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Appendix A – Full Rainfall, Climate Change and Storage Calculations

A1. FEH22 1 in 100 year rainfall depths

Duration (min)	R100 (mm)
15	25.35
30	33.99
60	43.70
120	51.41
240	58.21

A2. Application of 40% climate change allowance

15 min: $R100+CC = 25.35 \times 1.40 = 35.49 \text{ mm}$

30 min: $R100+CC = 33.99 \times 1.40 = 47.59 \text{ mm}$

60 min: $R100+CC = 43.70 \times 1.40 = 61.18 \text{ mm}$

120 min: $R100+CC = 51.41 \times 1.40 = 71.97 \text{ mm}$

240 min: $R100+CC = 58.21 \times 1.40 = 81.49 \text{ mm}$

A3. Full inflow calculations

15 min: $V_{in} = 156.00 \times (35.49 \div 1000) = 5.54 \text{ m}^3$

30 min: $V_{in} = 156.00 \times (47.59 \div 1000) = 7.42 \text{ m}^3$

60 min: $V_{in} = 156.00 \times (61.18 \div 1000) = 9.54 \text{ m}^3$

120 min: $V_{in} = 156.00 \times (71.97 \div 1000) = 11.23 \text{ m}^3$

240 min: $V_{in} = 156.00 \times (81.49 \div 1000) = 12.71 \text{ m}^3$

A4. Measured and design infiltration rate

Measured infiltration rate, $f = 0.00013462 \text{ m/s}$

Factor of Safety = 2.00

Design infiltration rate, $f_d = 0.00013462 \div 2.00 = 0.00006731 \text{ m/s}$

A5. Revised soakaway design calculations

Length, $L = 4.00 \text{ m}$

Width, $W = 2.50 \text{ m}$

Effective depth, $D = 1.00 \text{ m}$

Void ratio, $n = 0.90$

Storage volume, $V = L \times W \times D \times n$

$V = 4.00 \times 2.50 \times 1.00 \times 0.90 = 9.00 \text{ m}^3$

Conservative infiltration area (consistent with the original submission basis):

$A_{inf} = (L + W) \times D$

$A_{inf} = (4.00 + 2.50) \times 1.00 = 6.50 \text{ m}^2$

A6. Full outflow calculations for revised soakaway

15 min: $V_{out} = 0.00006731 \times 6.50 \times 900 = 0.39 \text{ m}^3$

30 min: $V_{out} = 0.00006731 \times 6.50 \times 1800 = 0.79 \text{ m}^3$

60 min: $V_{out} = 0.00006731 \times 6.50 \times 3600 = 1.58 \text{ m}^3$

120 min: $V_{out} = 0.00006731 \times 6.50 \times 7200 = 3.15 \text{ m}^3$

240 min: $V_{out} = 0.00006731 \times 6.50 \times 14400 = 6.30 \text{ m}^3$

A7. Full required storage calculations

$$15 \text{ min: } V_{\text{req}} = 5.54 - 0.39 = 5.14 \text{ m}^3$$

$$30 \text{ min: } V_{\text{req}} = 7.42 - 0.79 = 6.64 \text{ m}^3$$

$$60 \text{ min: } V_{\text{req}} = 9.54 - 1.58 = 7.97 \text{ m}^3$$

$$120 \text{ min: } V_{\text{req}} = 11.23 - 3.15 = 8.08 \text{ m}^3$$

$$240 \text{ min: } V_{\text{req}} = 12.71 - 6.30 = 6.41 \text{ m}^3$$

A8. Critical duration check

The maximum required storage occurs at 120 minutes:

$$\text{Critical required storage} = 8.08 \text{ m}^3$$

$$\text{Provided storage} = 9.00 \text{ m}^3$$

$$\text{Available margin} = 0.92 \text{ m}^3$$

A9. Half drain time calculation for revised soakaway

$$t_{50} = (0.50 \times V) \div (f_d \times A_{\text{inf}})$$

$$t_{50} = (0.50 \times 9.00) \div (0.00006731 \times 6.50)$$

$$t_{50} = 2.86 \text{ hours}$$

Appendix B – Sensitivity Assessment

Scenario	Design Basis	Required Storage (m ³)
Original proposal basis	10-year event (M10)	≈ 3.87
Reduced climate change check	1:100 year + 30% CC	7.29
Adopted revised design	1:100 year + 40% CC	8.08

This sensitivity assessment demonstrates that the increase in soakaway size relative to the original proposal is driven primarily by the higher design standard required by the LLFA. The adopted revised design also improves demonstrated groundwater separation through a shallower soakaway profile.